

TITLE OF THE INVENTION

[0001] Improved Remotely Controlled Toy Vehicles With Light(s)

CROSS-REFERENCE TO RELATED APPLICATIONS

[0002] This application claims benefit of U.S. Provisional Patent Application 60/423,182,
5 "Improved Remotely Controlled Toy Vehicles With Light(s)", filed November 1, 2002.

BACKGROUND OF THE INVENTION

[0003] The present invention relates generally to toy vehicles and, more particularly, to remotely controlled toy vehicles configured to transform and/or perform unusual stunts.
10 [0004] Remotely controlled toy vehicles are well known. One subset of these vehicles are configured to faithfully replicate known or otherwise conventional vehicles to allow users to pretend they are driving real vehicles. Another subset of such vehicles are more fanciful and designed for unusual performance capability, typically being capable of performing maneuvers that could or would not be performed by or with real vehicles. Some such vehicles are provided with lights to enhance the amusement value of such toys. Purchasers are attracted to and manufacturers try to
15 provide remotely controlled toy vehicles having new features and/or capabilities not previously provided in such vehicles for enhanced play value in such vehicles.

BRIEF SUMMARY OF THE INVENTION

[0005] A remotely controlled toy vehicle including at least an on-board power supply, at least a plurality of wheels supporting the vehicle for itinerant movement, at least one motor operably
20 coupled to at least one of the wheels to provide at least part of the itinerant movement of the vehicle, a controller circuit configured to selectively supply power from the power supply to the at least one motor in response to commands from a transmitter remote from the vehicle to move the toy vehicle and at least one light source, characterized by the controller circuit being configured to selectively supply power to illuminate the at least one light in response to a signal indicating the vehicle is
25 performing a particular maneuver.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0006] The foregoing summary, as well as the following detailed description of preferred embodiments of the invention, will be better understood when read in conjunction with the appended drawings. For the purpose of illustrating the invention, there is shown in the drawings an

embodiment which is presently preferred. It should be understood, however, that the invention is not limited to the precise arrangements and instrumentalities shown.

[0007] In the drawings:

5 [0008] Fig. 1 is a perspective view of a first longitudinal end of a toy vehicle incorporating the present invention;

[0009] Fig. 2 is a perspective view of a second longitudinal end of the toy vehicle of Fig. 1, showing a pivotal mount of a lateral chassis portion to a central chassis portion;

[0010] Fig. 2A is a detail view showing a torsional spring biasing the lateral chassis portion against the central chassis portion;

10 [0011] Fig. 3 is a side elevational view of the toy vehicle of Fig. 1 in a particular stunt performing configuration;

[0012] Fig. 4 is a block diagram of the electrical components of the toy vehicle of Figs. 1-3; and

[0013] Fig. 5 is a graph showing an exemplary variable illumination cycle for the light sources of the toy vehicle of Figs. 1-3.

15 DETAILED DESCRIPTION OF THE INVENTION

[0014] Certain terminology is used in the following description for convenience only and is not limiting. The words "right", "left", "top", "bottom", and the like designate directions in the drawings to which reference is made. The words "inner", "outer", "interior" and "exterior" refer to directions towards and away from, respectively, the geometric center of the toy vehicle or 20 designated parts thereof. The terminology includes the words above specifically mentioned, derivatives thereof and words of similar meaning.

[0015] Referring now to the figures, there is shown a preferred embodiment of a toy vehicle indicated generally at 10, in accordance with the present invention. The vehicle 10 has a first longitudinal end 12 in the foreground in Fig. 1, a second, opposing longitudinal end 14, a first lateral 25 side 16 and a second, opposing lateral side 18. Vehicle 10 further has a first major planar side 20 and a second, opposing major planar side 22. The vehicle 10 has a hinged chassis indicated generally at 26 that includes a central chassis portion 30 with first cover 31 and first and second lateral chassis portions 40 and 70, respectively. The first lateral chassis portion 40 is pivotally coupled with the central chassis portion 30 on the first lateral side 16 of the vehicle 10. The second 30 lateral chassis portion 70 is a mirror image of the first lateral chassis portion 40 and is pivotally coupled with the central chassis portion 30 on the second lateral side 18 of the vehicle 10. A plurality, in particular, two road wheels 42 and 44 are rotatably supported from the first chassis

portion 40. Another plurality of identical wheels 42, 44 is rotatably supported from the second chassis portion 70. The first and second lateral chassis portions 40, 70 are coupled with the central chassis portion so as to pivot with respect to the central chassis portion 30 in a common plane, which is generally parallel to the plane of Fig. 3.

5 [0016] Since the first and second chassis portions 40 and 70 are mirror images, only the first chassis portion 40 will be described in further detail. The first lateral chassis portion 40 includes a reversible electric motor 46 enclosed within a first cover 50 on the first chassis portion 40. The motor 46 is drivingly coupled with at least one and preferably with each of the road wheels 42, 44 supported on the lateral chassis portion to rotate the driven wheels in the same direction through a gear train (not seen in any of the figures) within the chassis portion 40. The gear train is substantially identical to that shown in U.S. Patent No. 6,598,098, incorporated by reference herein, with a central driven gear driven directly by the motor pinion, a pair of spur gears driven by the central drive gear and a pair of wheel gears driven by the spur gears, each wheel gear including a splined drive shaft non-rotatably received in one of the wheels 42, 44.

10 15 [0017] The first longitudinal end 12 of the first lateral chassis portion 40 is coupled with the first longitudinal end 12 of the central chassis portion 30 through a link 54 (best seen in Fig. 3). Link 54 has a proximal end pivotally coupled to the central chassis portion 30 to pivot about a pivot axis transverse to the major planes of the vehicle. The distal end of the link 54 is also provided with a transverse guide member in the form of a protruding pin or pin equivalent 56, which is received in 20 and slides along a longitudinally extending slot 52 on an inner lateral side of the first lateral chassis portion 40.

25 [0018] Fig. 2 depicts the direct pivotal mounting of the first lateral chassis portion 40 with the central chassis portion 30 at the second longitudinal end 14 of the vehicle. The mounting of the second lateral portion 70 is a mirror image. A pivot member (e.g. pin) 62 is transverse to the major plane of the vehicle 10 and extends through overlapping flanges 30a, 30b of the central chassis portion 30 and 40a, 40b of the first lateral chassis portion 40. As indicated in detail Fig. 2A, a torsional coil spring 64 is positioned around pivot member 62. A first tang (not illustrated) of the spring 64 is engaged with a flange of the first lateral chassis portion 40. A second, opposing tang (not illustrated), is similarly engaged with a flange element of the central chassis portion 30. The 30 torsional coil spring 64 is located to bias the first lateral chassis portion 40 inward towards the central chassis portion 30 and the inward position shown in Fig. 1. The bias of the spring 64, however, can be overcome during operation of the vehicle 10 to cause one or both lateral chassis portions 40, 70, to pivot outwardly from the central chassis portion 30, as is illustrated in Fig. 3.

[0019] A power supply 38, preferably a rechargeable battery pack, is preferably located at the extreme second longitudinal end 14 of the vehicle 10 on the end of the central chassis portion 30 to shift the center of gravity of the vehicle 10 closer towards the second longitudinal end 14 of the vehicle to assist the vehicle 10 in performing certain types of stunts, particularly the stunt shown in Fig. 3. In the embodiment illustrated, the battery power supply 38 is accessible via a battery box door 39 pivotably mounted to the chassis 30.

[0020] Referring to Figs. 1 and 3, each lateral chassis portion 40, 70 is provided with a transparent cover 60 at the first longitudinal end of the chassis portion 40, 70 over a light source, preferably a high intensity light emitting diode (“LED”) 36 (see Fig. 1). Preferably too, each link 54 10 is formed from a transparent polymer material and also includes a high intensity LED 36 as seen in Fig. 3 at its proximal end where it is pivotally coupled by link 54 with the central chassis portion 30.

[0021] Control of itinerant movement of the vehicle 10 is conventional. The vehicle includes circuitry 100 indicated in block diagram form in Fig. 4, preferably located in the central chassis portion 30, which and including a wireless, preferably radio frequency (RF) receiver 102, 15 preprogrammed microprocessor or microcontroller 104 operably coupled with receiver 102 and with first and second propulsion/steering motor control circuits 106, 106’, preferably identical, each driving a separate one of the preferably identical motors 46, 46’. The operation of the motors 46, 46’ are controlled by the microprocessor 104 in response to control signals received by the receiver 102 from a remote control unit 112 generating and transmitting wireless maneuver control signals.

20 The vehicle 10 is propelled by controlling each motor 46, 46’ to rotate the various road wheels 42, 44 in the same direction at the same speed and is steered by controlling the motors to drive the wheels on either lateral side 16, 18 of either lateral chassis portion 40, 70 differently, either in different directions or at different speeds or both. By rotating the wheels 42, 44 on opposite lateral sides 16, 18 in opposite directions, the vehicle 10 can be made to spin in place. Centrifugal force 25 causes the free longitudinal end of each lateral chassis portion 40, 70 at the first longitudinal end 12 of the vehicle 10 to spread apart. The spreading apart of the lateral chassis portions 40, 70 causes a further shift of the center of gravity of the vehicle 10 towards the second longitudinal end 14 so that, if the vehicle 10 continues to be spun in place, it will raise its first longitudinal end 12 and spin about its second longitudinal end 14 in an upright manner as seen in Fig. 3. As can be seen in Fig. 30 3, vehicle 10 tends to be supported on the corners and sidewalls of its road wheels 44 at the second end 14 of the vehicle 10 during such maneuvers.

[0022] While the light sources 36 conventionally might be hard wired with the battery power supply 38 to be constantly on when on-off-switch 110 is set to the ON position, closing the circuitry

through the battery 38, according to the present invention, the light sources 36 preferably are individually coupled into circuit using a switch (e.g., a transistor not separately depicted) controlled by the microprocessor 104. In this way illumination of each light source 36 can be individually and selectively controlled with the microprocessor 104. Further according to the invention, the control circuitry 100 can be configured to operate the light sources 36 in more than one mode of operation. Preferably, circuitry 100 is configured to operate the light sources 36 in at least two different modes of operation. More particularly, the microprocessor 104 is configured to operate the light sources 36 in at least two different modes of operation.

[0023] This can be done in a number of ways. As explained above, vehicle 10 performs a particular stunt in which it stands up on its second end 14 and spins in place with its lateral chassis portions 40, 70 pivoted away from the central chassis portion 30. Preferably, vehicle 10 is provided with a momentary closure switch 80 (Fig. 4) positioned to change states when at least one of the lateral chassis portions 40, 70 is pivoted away from the central chassis portion 30. The microprocessor 104 is preferably configured to operate LED's 36 in two different modes depending upon the state of switch 80, as communicated to the microprocessor 104 by a signal generated by the switch 80 and sent to the microprocessor 104 along line 82. Unless the lateral chassis portion 40 or 70 is pivoted away from the central chassis portion 30, switch 80 is in a first state and the microprocessor 104 responds to that state in a first mode of operation of the LED's 36, for example illuminating some (e.g. the lateral chassis mounted pair) or all of the LED's continuously. When the switch 80 is in another state indicating that at least one of the operably coupled lateral chassis portions 40, 70 is pivoted away from the central chassis portion 30, the microprocessor 104 operates in another mode, for example flashing some (e.g., either the link pair or the lateral chassis pair) or all of the LED's 36.

[0024] Fig. 5 graphically depicts a suggested sequence of operating the light sources 36, which includes flashing all of the LED's 36 in a varying manner over time. Fig. 5 is a chart of LED illumination intensity over time. Preferably, the variation in operation, i.e., the illumination intensity of the LED, changes in consecutive time period blocks indicated T1, T2, etc. While they are illustrated as being equal, they need not be. In the first block, T1 (e.g. about five seconds), the LED's 36 are varied from zero to fifty percent of maximum intensity and back to zero twice at a uniform rate over the period (i.e., as depicted over five seconds) or, if desired, over a substantial portion (e.g. about four seconds) of the period. If switch 80 remains in the second state after the end of the first period T1, the microprocessor 104 enters the second time period T2 and second mode of illumination during which the LED's 36 are varied from zero to seventy-five percent of maximum

intensity and back four times at a constant rate over the period T2. If the switch 80 remains in the second state after period T2 (i.e. more than 10 seconds), the third period T3 and third mode are entered in which the intensity is varied from zero to a maximum eight times at a uniform rate. If the fourth consecutive time period T4 is entered, the LED's 36 are illuminated constantly at full

5 intensity for the full period. If the fifth period T5 is entered, the LED's are turned off for the length of the period. Thus, T4 and T5 together constitute one on-off cycle. If a sixth period, T6, is entered, the LED's 36 are operated intermittently with a full off period between pairs of consecutive spikes of one-hundred percent illumination as depicted or between individual spikes of illumination (not separately shown) to create a strobe effect. As consecutive time periods continue to be entered,

10 other modes of illumination can be created. Alternatively, previous practiced modes can be repeated or the last mode repeated indefinitely. Other possible modes include varying intensity levels down to a non-zero level and illuminating the light sources in series or in various pairs or randomly. The microprocessor 104 might utilize a stored look-up table to control the different illumination modes.

15 [0025] It will be appreciated by those skilled in the art that changes could be made to the embodiments described above without departing from the broad inventive concept thereof. For example, instead of responding to a sensed state of the vehicle, the microprocessor can be programmed to respond to different commanded operations, for example illuminating in a first mode when commanded to go forward, in another mode when commanded to reverse, in still another

20 mode for turning, yet another mode when stopped and yet another mode when spinning in place. If the vehicle is capable of transforming itself as described, for example, in US Patent Nos. 5,762,533; 5,474,486 and 5,332,469 or is capable of performing unusual stunts as described, for example, in US Patent Nos. 5,429,543; 5,667,420; 5,882,241 or 6,024,627, the mode of illumination can change in response to commands to perform the transformation or perform the stunt. It is understood,

25 therefore, that this invention is not limited to the particular embodiments disclosed, but it is intended to cover modifications within the spirit and scope of the present invention as defined by the appended claims.